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Alexandri Pasitigri, vicus ad lacum Chaldaicum vocatur Aphle: unde Susa navigatione LXVMD passuum absunt.

Susianem ab Elymaide disterminat amnis Eulæus, ortus in Medis, modicoque spatio cuniculo conditus, hac rursus exortus, et per Mesabatenen lapsus, circuit arcem Susorum, ac Dianæ templum augustissimum illis gentibus, et ipse in magnâ cærimoniâ. Siquidem reges non ex alio bibunt, et ob id in longinquâ portant. Recepit amnem Hedypnum, præter Asylum Persarum venientem, Adunam ex Susianis.

Infra Eulæum Elymais est, in ora juncta Persidi, a flumine Oroati ad Characem, CCXL mill. passuum.

PLINY, xxxi. 3 :—

Parthorum reges ex Choaspe et Eulæo tantum bibunt: et eæ quamvis in longinquâ comitatur illos. Et horum placere potum, non quia sint amnes, adparet: quoniam nec è Tigri, nec Euphrate, nec è multis aliis bibunt.

PTOLEMÆUS, lib. vi. :—

Susianæ situs, cap. iii.

Mosæi flu. ostia	..	..	..	..	82	:	30	40
Fontes fluvii	..	..	..	..	82	30	:	33 0
Eulæi flu. ostia	..	..	..	..	84	33	:	30 40
Fontes fl. in Susianâ	..	..	..	..	83	:	35	0
Fontes fl. in Mediâ	..	..	..	..	86	:	38	0
Conjunctio fontium	..	..	..	..	84	:	33	0
Oroatidis flu. ostia	..	..	..	..	86	30	:	30 30
Fontes fluvii	..	..	..	..	88	30	:	34 40
Susa	..	..	..	..	84	:	34	15

QUINTUS CURTIUS (RUFUS), ii. 9 :—

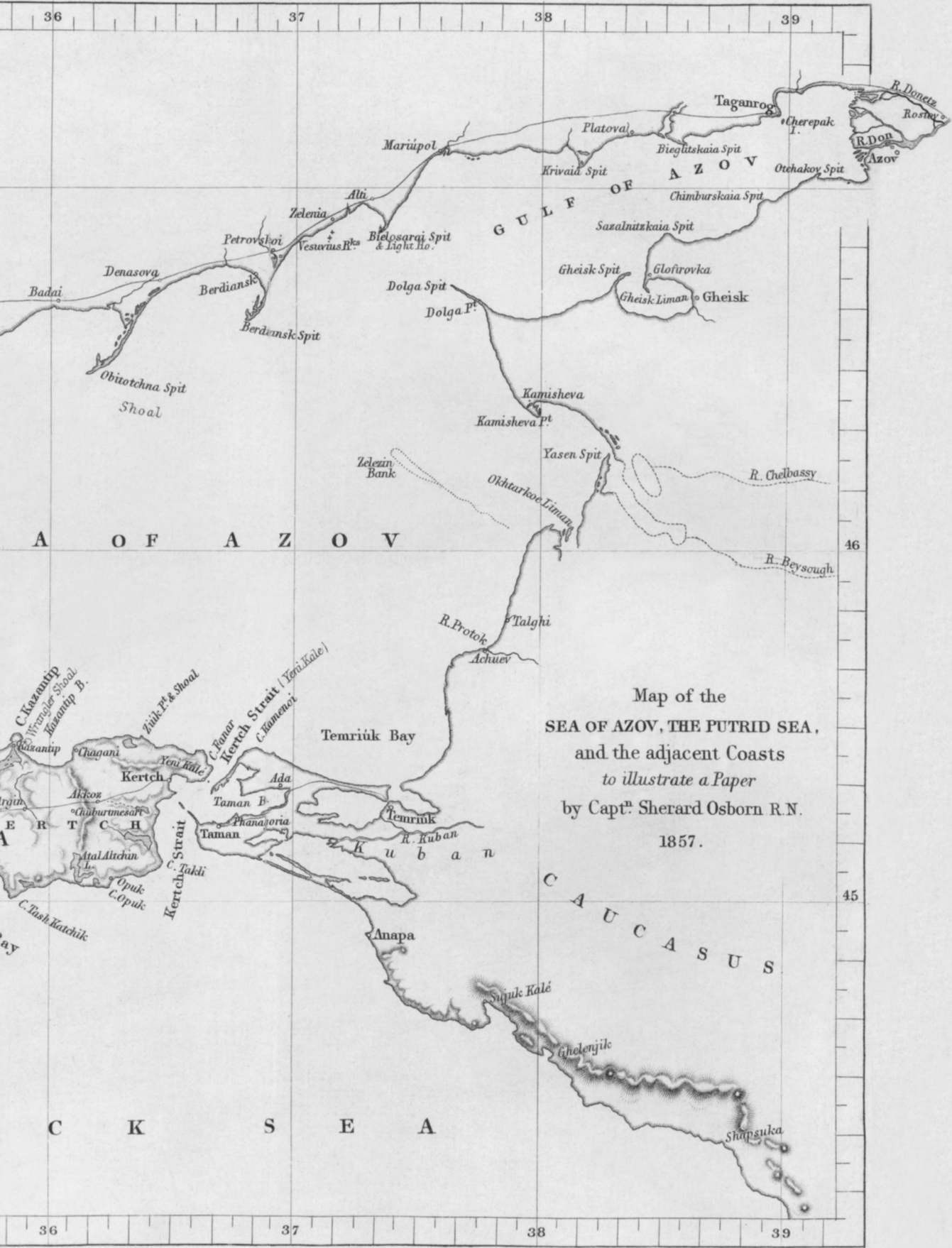
Jamque Susa ei adituro Abulites, regionis ejus præfectus, sive Darei jussu, ut Alexandrum præda retineret, sive suâ sponte, filium obviam misit, traditurum se urbem promittens. Benigne juvenem excepit rex, et eodem duce ad Choaspin amnem pervenit, delicatam, ut fama est, vehementem aquam. Hic Abulites cum donis regalis opulentiae occurrit.

V.—*On the Geography of the Sea of Azov, the Putrid Sea, and adjacent Coasts*, &c. By Capt. SHERARD OSBORN, R.N., C.B., F.R.G.S., &c.

Read, February 23, 1857.

UNDER the above uncomplimentary name is known the extensive series of shallow lagoons and marshes which wash the major portion of the north-east face of the Crimean Peninsula, and which doubtless at one time formed a portion of the sea of Azov, or, perhaps, more correctly speaking in those distant periods when it was better known as the "Palus Mæotis."*

* See chapter on Spit of Arabat.



Map of the
SEA OF AZOV, THE PUTRID SEA,
and the adjacent Coasts
to illustrate a Paper
by Capt. Sherard Osborn R.N.
1857.

At the time of the Russian invasion of the Crimea under Marshal Lacy in 1736-37, that portion of the Sivash which lies westward of the Chongar Peninsula was called the River Chongar *—a nomenclature which has been departed from in modern charts without any sufficient cause, for it decidedly partakes far more of the character of a river draining the Crimean and Tauridian steppe, which borders it, than it does of that of a sea.

Of the above portion of the Sivash we shall not presume to speak, no English naval officer having visited it during the late operations, and the information gleaned of the Russians being of that vague condemnatory nature that justified one in believing that they might be as incorrect in their opinions and inferences as to its character and the insalubrity of its shores as they appeared to be ill-informed of the capabilities and physical character of that portion of the Sivash which extends from Ghenitchi to Arabat.

The geographical contour of the Sivash, eastward of the point where the Chongar and Changkoi Peninsulas nearly meet (and are actually connected by a long causeway and a bridge), is that of which we will speak.

This portion is nearly 70 miles long, in a N.N.W. and S.S.E. direction, and varies in breadth from 20 miles to as little as 4. The eastern and northern sides of this area are but slightly indented or irregular, but the western, or Crimean shore, contains long indentations of a peculiar character which run into the steppe for distances varying from 10 to 15 miles in about a S.45°W. direction. These indentations are known to the Tartar inhabitants of the steppe by the names of the promontories which separate them, and they again are called after that of the most important villages situated upon them. For instance—Changkoi, Tarkanrar, and Biúk Keneges give titles to the points on which they stand and the inlets to the s. of them.

Around these indentations, as well as throughout the whole coast of this Sivash, bordered by the steppe of the Crimea and Taurida, commencing at Arabat and passing north-westerly towards Chongar and Ghenitchi, the shore, with few exceptions, is an abrupt wall of earth, marl, or clay, in short, the edge of the steppe, as fresh-looking and as escarped, as if Time had laid no finger on it since the creation. The height of this abrupt cliff varies from 5 to 20 feet, except at the delta formed by the discharge of the Salgir and Kara-Su rivers, in about lat. 45° 35' N., where a low and sloping shore exists.

The eastern shores of the Sivash, along the Arabat Spit, are

* The Memoirs of Russia, by General Marestein, of which an admirable English version has lately been published by our learned countryman, the Hertfordshire Incumbent, is my authority upon this point.—See pages 178-9, vol. i.

merely those of a sandbank, except at the two isolated fragments of steppe land,* which exist upon the spit, where a steep wall of earth is again found on the side of the Sivash.

These two solitary fragments of steppe, which exist on Arabat Spit, are very remarkable, and, until a better name be found for them, we will for distinction sake speak of them by the term applied generally by the English navigators in 1855, "North Chakrak" and "South Chakrak" (Chakrak being a term used by Tartars when speaking of them).

Both these "Chakraks" throw off, on their western base, an extensive series of mud and gravel banks, which separate as it were the Sivash into three almost distinct basins. The northern basin is of an oblong form, of which the sides are barely 10 miles in extent, and comprised between Ghenitchi, Chongar, and the (east and west) axis of the Northern Chakrak; it contains a superficial area of about 60 square miles of water and marsh.

The Russians have lately asserted, and it has been repeated by people whose statements are deserving of all respect, that a depth of water, equal to 9 English feet, leads through this northern basin, from the straits of Ghenitchi to those of Chongar. If this should be the case, it seems likely to have been only very lately discovered, for, in May, 1855, when Ghenitchi was attacked by the allied squadron, numbers of small vessels, drawing far less water than 9 feet, were discharging military stores at that place, to be conveyed by a circuitous land carriage, over the strait of Chongar, into the Crimea; whereas, according to this information, those very vessels should have landed their cargoes on the Peninsula of Changkoi, far beyond the reach of our attack. Still more strange is it, that although we destroyed some 80 sail of vessels in Ghenitchi, and in the hurry left 14 untouched, that the Russian authorities, after removing their masts and lightening them to their utmost, should not have moored them out of range of our guns. Indeed, the furthest of these remaining 14 vessels, after every effort to save her had been made, was repeatedly hulled by the Lancaster gun of H. M.'s gun vessel 'Wrangler,' Commander Hugh Burgoyne, and was at that time within 5000 yards of the Sea of Azov.

The northern basin of the Sivash includes the only outlet which exists for the superabundant waters of a sea which drains two-thirds of the Crimean peninsula. On the eastern entrance of the strait a sand-bar has been formed, sweeping with a curve into Oukliouk Liman; over its centre a short, narrow, and tortuous channel existed in 1855, for it is necessary to mention dates when speaking of sand-banks, as they may vary much, especially

* See the description of these given under the head of Arabat Spit.

when, as in the case I speak of, the bank is evidently formed by the deposit of the Sivash current and counter-currents of the Azov. The water on the bar, under favourable circumstances, such as a perfect calm in both seas, stood at about six feet vertical depth, but increased a foot or decreased two feet with astonishing rapidity when the wind freshened from the east or from the west.

Directly the bar was crossed, a narrow gully of water, containing 10 feet, was entered, which led up for the narrowest point of the strait, between the spit on the southern hand and a low projection from the steppe on the other. This gully of water was very narrow, perhaps as little as 150 feet across, bounded on either side by an abrupt mud-bank covered by a few inches of water. Except with a leading wind, vessels must be tracked or towed through this channel, into what has been dignified with the name of the harbour of Ghenitchi, or, in Russian nomenclature, "Ghenitchesk."

Directly the narrowest part of this strait is passed, and it is there as much as 15 English feet deep, the channel forks into two branches—one leading about w.s.w. or s.w., and the other veering north.

The north channel forms the harbour, and preserves some depth for about a quarter of a mile, after which it shoals so much, that we repeatedly saw the Cossack horse fording it, and only skiffs of the lightest description were ever seen passing by it, through the marshes, into the open water 3 miles farther on.

Within that quarter of a mile, and under the eastern face of Ghenitchi point, nearly all the Russian transports were found crowded together by us in May, 1855.

The western and south-western channel is evidently the true one; it was strangely tortuous, and, judging by the extent to which some of the wrecks were submerged in it, we should say it varied from 4 feet to 7 feet in depth. After leading through a belt of reed and grass-grown morasses, averaging about 3 miles in width (in an east and west direction), this channel evidently opened into the water space of the north basin.

In that water space, like every other portion of the Sivash seen by us, where devoid of reeds, was clear, blue, and sparkling, as if the depth of its waters equalled that of the Atlantic. On it, after all communication for the Russians ceased along the Spit of Arabat, and in the Sea of Azov, we observed small boats to be often plying between Chongar peninsula, and an extempore pier erected on the eastern edge of the marshes, three miles beyond Ghenitchi.

The deepest water in the northern basin flows from the landing-place alluded to, with a gentle curve towards the Peninsula of

Tchougar, and then follows along its shore to the narrow passage between it and Changkoi Peninsula.

In it the water varies from 8 ft. to 4 ft. 6 in., the fluctuations of depth my informants told me being so sudden that the Russians had never been able to use it for navigable purposes, and throughout the fall of the year 1854, and early part of 1855, until the allied admirals (Sir Édmond Lyons and Admiral Bruat) crushed the Russian sea-transport, the enemy used to draw their supplies from the regions watered by the Volga, Don, &c., by carrying everything to Ghenitchi, disembarking it there, and thence, by land transport, down the Tchougar Peninsula, into the Crimea. Ghenitchi is the only town standing on the space alluded to; it became very important during the war, as the great military depôt for corn, rye, and fish, consumed by the enormous Russian armies poured into, and buried in the Crimea. The better portion of the town consisted of houses built on the edge of the steppe, the church, government-offices, with their green roofs, and some of those belonging to the better class of residents, running in a couple of streets in an east and west direction, and overlooking the strait. The steppe, however, throws out a few hundred yards of low land at its base, and on that flat, as well as swarming up the face of the steep acclivity, were the dingy-looking abodes of the mass of the population, the majority of them of Greek descent. Apart from occupations connected with the war, the inhabitants of Ghenitchi were largely engaged in the salt-trade, an important branch of commerce in Southern Russia, and in the curing and sale of fish, an article of enormous consumption in the dominions of the Czar. The direct route for Kertch, and Kaffa, and the Kuban district, lies down the Arabat Spit, and the postal service, through Ghenitchi, renders it a point of passage for travellers, and the writer was assured at Odessa, that persons going to Kertch, even from that part of Russia, preferred the Arabat Spit road to that through Perekop, and across the Crimean steppe.

The salt of Ghenitchi is mainly drawn from the salines on Arabat Spit, those of the Northern Chakrak being the most important. Trains of arabas, each perhaps capable of carrying 15 cwt. of salt, dragged by two oxen, make their slow and toilsome way to, and from the interior of Russia, to supply the inhabitants with this necessary of life. The Russian government, to encourage the native manufacture of salt, have prohibited the importation of salt in the ports of the Black Sea and the Sea of Azov; but nature, and a hot sun, seem to have done far more for the production of salt in the salines of the Sivash than Muscovite commercial enterprise. This subject, as well as that of the

fisheries, will be treated of hereafter, under the head of Commerce of the Sea of Azov.

The northern basin of the Sivash is divided from the southern one by a central area, which bears far more, in its usual aspect, that morass-like character, which the general reader would be inclined to impute to the term Putrid Sea. It extends from the centre of the "North Chakrak" to the southern edge of the "South Chakrak." It is of an oblong form, about 13 miles long and 8 miles wide, including the inlet of Changkoi. With the exception of the channel leading up to Chongar-bridge, which skirts the steppe, and a similar one, with 4 ft. 6 in. water in it, which communicates with the southern basin, the whole of this area is a great series of mud-banks, covered with weeds and reeds, intersected here and there with gullies of water, having no outlet, and for miles in the deepest places, under favourable circumstances, we found only a foot or six inches water covering the mud and gravelly bottom. The inlet of Changkoi is equally shallow, and we crossed it twice, finding less than a foot of water in July, but a very short distance within its entrance. In this solitude, breed vast numbers of wild fowl, and all the summer long we found Muscovy ducks and flocks of divers frequenting the lagoons. In the early spring, or during the autumnal rains, the waters thrown off the Crimean steppe and mountains flood the marshes of this great quagmire; but in the summer, the heat of the sun, and the paucity of the water render it little else than a great salt-pan—or saline.

The rapid evaporation, and the extraordinary mirage from the heated atmosphere playing over the surface of this area in a summer's day, was very striking, and between sunrise and sunset, at that season of the year, it was as utterly impossible to distinguish objects but a mile or so distant upon it, as it would be had a cauldron of boiling liquid been there in its place. There are roads through these morasses, only known, however, to the Tartars and smugglers, who are ever at war with Russian custom-houses and tax-gatherers.

The Crimean side of this area is a steppe, but from the quantity of hay it yielded to the Russian cavalry, it decidedly could not be called a barren one. The edge of this steppe is, about Changkoi and Chongar, not more than 20 feet vertical height; we easily scaled it by means of a ladder formed of the masts of our boats. The channel about Changkoi, and across to Chongar, is deepest at about 150 to 200 yards off-shore, but ridges of mud and gravel, covered with heavy weeds, showed the action of occasional violent freshets from the space to the westward. In landing at both these peninsulas, indeed all round this Sivash, the boats of

lightest draft have to be dragged through a fat and stinking mud or sludge for fully 100 yards, and, at the base of the steppe, a narrow belt of clay afforded, in most places, just room enough for a boat to be dragged out high and dry.

At the point where the Changkoi and Chongar peninsulas approach each other most, embankments have been thrown out over the shallows, and a wooden bridge connects the Russian and Crimean shores. The effect of these embankments is naturally to increase the force of the current under the centre of the bridge, and, consequently, deepen the water in that locality by its action upon the mud. The natural contraction of the channel, however, in this neighbourhood, rendered it necessary to bridge the intervening space, and, subsequent to 1737, when Marshal Lacy retreated out of the Crimea by a temporary bridge thrown over this spot, the Russians constructed a very rough one, which was principally used by the waggons or arabas in the transport of salt into Russia Proper. After the commencement of the late war, and the fall of Eupatoria to the allies, the route from Perekop to Sebastopol and Simpheropol was so exposed to the forays of enterprising or active bodies of cavalry, that the Russians turned their attention to the development of the Chongar route. Wood for piles was transported from the Don, and from Kherson on the Dnieper, and other measures taken to increase the capabilities of the bridge—and, until the Russians discovered that no serious attack was made on the main route of their communications *viâ* Perekop, much attention was directed to that *viâ* Chongar.

In reply to queries as to whether the Tartar or Cossack inhabitants of the shores of this central area ever crossed by fording it on horseback, our informants stated that it was considered highly dangerous on account of the mud holes, into which horse and man might be plunged beyond all hope of being saved. In 1855, however, some Cossack horse, panic-stricken, did wade across from the marshes of the Northern Chakrak to Chongar Peninsula; it was considered a great feat by the Russians, though we could not accuse ourselves of ever having been the cause of their alarm or gallantry.

The southern portion of the Sivash is that to which we will now turn. It is about 40 miles long, commencing at the Southern Chakrak and ending at Fort Arabat. The Arabat Spit throughout the whole of this distance is low and sandy, varying from 300 yards to 300 feet in width. Down the centre of this southern basin, a maximum depth of about 4 ft. 6 in. was found to exist, the water shoaling steadily away to either shore, until in calm weather a hundred yards on each side was merely a quagmire, consisting of water, mud, and decomposed vegetable filth, and a foul unctuous bituminous deposit.

As we advanced from either shore towards the centre, this belt of filthy residuum, the exhalations from which give the name of Putrid to this sea, a bluish white soft clay was reached, much impregnated with salt, interspersed with belts of gravel, weed, and beds of fossil shell (small bivalves). It required some care in wading about here, even when holding on to the gunwale of a boat, for there were numerous holes into which the legs would otherwise have sunk deep enough, it was very evident, to have endangered a wader; possibly these spots were extinct mud volcanoes, for it was difficult to detect any difference of temperature between them and the Sivash generally, which throughout the summer felt like tepid water. As the drying up of the Crimean rivers took place, and rapid evaporation diminished the waters of the Sivash, large quantities of coarse crystals of salt were deposited all along the margin of the Sivash, and the intense salty bitterness of the waters of this extraordinary sea recalled vividly the descriptions we had read of that of the Dead Sea in Judea. The Sivash here, as in the clear portion to the northward, is far from unpleasing to the seaman's eye. Its waters are clear, blue, and sparkling, and form a pleasing contrast to the dingy yellow of the muddy Azov, bounded away to the far-west by the lofty ridges around the Chatir-Dagh, which about Kaffa and Kara-su Bazaar approach sufficiently close to relieve the eye of the traveller tired of the endless tiresome steppe, the horizon and framework to the scene, everywhere else when within the straits of Kertch.

It is possible that the amount of saltiness of the waters of the Sivash differs materially, and that it is purely dependent upon beds of salt in particular localities. We found it, however, bitterly salt wherever we went, the hands tingled as if placed in strong brine, and salt was freely deposited on the boat's sides and on the cars. None of the inhabitants of the Arabat Spit, and they were at one time numerous, drank of the waters of the Sivash, nor their flocks either. On that subject more information will be found under the head of Arabat Spit.

At the south extreme of the southern basin of the Sivash, the water again becomes excessively shoal, and on the Crimean shore reeds and weeds are generally more abundant than on the eastern side. The narrowest part of this basin is where the Salgir and Kara-su rivers discharge themselves by a common delta, though with two mouths, into the Sivash. This delta has evidently worn down the edge of the edge and deposited it in a long sloping inclination, but no channel could be found over the shallows which fringe these rivers' mouths. Within the entrance, Captain Commerell, who waded both of them, reported as much as 4 feet water in the Salgir, which had evidently been embanked, had a tract-path along its edge, and showed symptoms of being used as an artery

for supplying Simpheropol with produce brought from the eastward.

This narrow part of the Sivash and the river Saigir was the only water-communication within the borders of the Putrid Sea which we could learn was used as a means of supplying Simpheropol and Sebastopol by the Russians, and it ceased after Captain Rowley Lambert of H.M.S. 'Curlew' burnt the pontoons employed in it. Attention was first called to the subject by a letter in the 'Times,' signed by the 'Hertfordshire Incumbent,' subsequent to the forcing of the Straits of Kertch by the allied squadrons of Admiral (now Lord) Lyons and Admiral Bruat. The *modus operandi* was as follows: corn, rye, fish, and other products of the rich provinces watered by the Volga, Don, and the eastern rivers, were floated down to Taganrog, thence transhipped in Greek and Ragusan vessels, which, under Russian flag, traded in the Sea of Azov. They carried these stores to Arabat Bay, landed them at the fort, and, in a convenient spot, called by us Kiten Bay; thence the large number of draught animals and arabas at the command of the general commanding in Kertch Peninsula, enabled them to be forwarded up the spit, until at a convenient point opposite the Saigir; here they were embarked in broad flat pontoons, which, by the fluctuations of depth common to the Sivash, were able to slip into the Saigir over the shoals, and be thence tracked up as high as it was navigable, where the land-transport of the Crimea finally placed them at their destination—a pretty good proof of the energy and ability with which the Russians, when pressed, called into play all the resources of the country. Yet, on the other hand, it might be argued, that had they during peace taken more trouble to develop the facilities for intercommunication between one part of the empire and the other, instead of embarking all the national resources in the casting of cannon and building of forts, they would have been able to make a far more stubborn resistance, and not so entirely have broken down in the means of transport, after a trial extending over about 18 months.

A most remarkable and general feature of the Sivash is the fluctuation of its depth according to the direction of the wind. This is likewise a characteristic of the Sea of Azov, but the freshness of its waters, and their low density, explain the phenomenon far more easily than in the case of the Sivash, which must be far more salt and dense than any ocean. The shallowness of its depth is the only explanation that can be given for what we will now describe.

When the wind freshens from the eastward, the waters of the Sivash accumulate to leeward on the Crimean shore, and leave hundreds of yards of dry mud and marsh whence they have flowed.

The Tartars assert that 2 feet vertical is about the average height to which the water accumulates on the leeward side; and, although a formidable assertion, where the whole maximum depth is not 5 feet, still we saw no reason to disbelieve it, and it was not more extraordinary than the undoubted fact of spots of 6 feet of water being occasionally blown dry in the Gulf of Azov.

The Londoner may, I am told, witness the action of wind on water, on a small scale, by observing the Serpentine on a windy day, when it is blowing from one side of it to the other—results analogous to the subsiding of the water of the Sivash on one shore and its accumulation on the other then take place. The rapid current, which almost incessantly flows in or out of the Sivash, is fully accounted for by the changes of level within its great area, and the effort naturally made to fill the void; for instance, the very same wind which blows the waters of the Sivash towards the Crimean shore causes the Sea of Azov to be higher on its western than on its eastern border, creating of course a tendency to master the natural outflowing drainage of the Sivash.

Whether the direction of the current in Ghenitchi Strait is dependent upon the wind blowing at that outlet is very doubtful, for, between the three remote points of Arabat, Perekop and Ghenitchi (all situated on the shores of the Putrid Sea), there may possibly be at one time as many different winds blowing; the position of the culminating point of the waters of the Sivash, and the direction of effort of currents, whether in the strait or within the area of the Sivash, must of course depend upon which of those winds was the most powerful. For instance, a strong n.w. breeze in the Chongar river would cause the current in the strait to be flowing eastward against light airs in that direction, which might be felt at Ghenitchi.

And in a furious west wind, which in the summer sometimes sweeps the Tauridian steppe, we have seen the northern part of the Sivash almost blown dry in two hours time, and the bar across Ghenitchi Strait might have been easily waded by a man. Yet, at the same time, the southern basin of the Sivash would have shown a considerable increase of water, and a southerly current, in the teeth of a s.e. breeze blowing from the Black Sea over the Isthmus of Kaffa.

Next to these changes of level, and the rapid currents they occasion, the disagreeable exhalations from the shores of this sea have long been a subject of remark. The Russian authorities state it to be not only offensive, which it unquestionably is, but unhealthy likewise. On sanitary points, however, when the health of the Russian armies is the test by which salubrity is measured, it is as well to be incredulous; we saw men who had grown grey

on the Spit of Arabat, and who laughed at the question, replying to our queries, "Oh! the Russians say so because their soldiers die of putrid fevers. Where don't they die of putrid fevers? half-starved, ill-cared for, and over-worked, they die everywhere and abuse every place." We decidedly suffered from nothing but the offence to the sense of smell, and some of our vessels were months breathing the tainted air. After a hot calm day a sudden shift of wind off the Sivash brought the smell disagreeably strong; or a visit to its shores, and a walk in the mud, when the water had receded, was very trying to the olfactory nerves. The smell was like decayed vegetation, mixed with a peculiar smell not unlike gas-water, from which I infer that there are bituminous vents in the Sivash, similar to those existing in the Kertch Peninsula, and on Taman or Temriúk; indeed, mixed in the mud of this sea there was an oily tar-like substance, which I believe to be immediately connected with the putridity of the Sivash, and to ferment with the action of the sun and salt, throwing off a foul scum which one approached very unwillingly. That birds should breed in such a salt marsh is very remarkable, as showing that their food is there to be found. The Muscovy duck and the common diver, or shag, fed and bred in the Sivash in vast numbers; and in the shoal water and marshes, abreast of Chongar Strait, in which we spent a broiling day, we could see abundance of weed, as well as shoals of young fish, though the water was so salt that our shins, where it touched, became as red as if placed in exceedingly hot water.

Winds.—We were led to expect that constant westerly or s.w. winds would prevail during the early part of the navigable season in the Sea of Azov, but did not experience any such winds, though there can be no doubt that there, as elsewhere throughout Europe, the winds, after the vernal equinox, have a general southerly or westerly tendency, bringing warmer weather, and ushering in the summer. Towards July hot easterly winds set in, and, after the middle of the month, blow with considerable violence; they seldom lasted through the night, especially in with the land. This mistral generally commenced and subsided with the rising and setting of the sun. A strong glare and haze to the eastward at day-break was an invariable forerunner of this wind, and if upon the western coast of the Sea of Azov, a heavy swell always preceded the wind.

It is this easterly wind which has been known to diminish the water in the Gulf of Azov to the extent of 4 or 5 feet. Dr. Clarke, the traveller, asserts that the inhabitants of Taganrog have crossed to the opposite shore dry-footed, but that I believe questionable, as it would involve a channel 11 feet deep being blown dry!

Vessels in shallow water, on the east side of the Sea of Azov, as well as in the gulf, run a risk of being left aground during these strong breezes, but if care has been taken to anchor where the bottom is not hard sand, there is no danger in letting a vessel lie upon the ground—there being no rocks throughout the whole length and breadth of the Sea of Azov, except the “Vesuvius Rocks” off the town of Zelenia, a spot little likely to be visited by merchantmen.

Arabat Bay, and the whole extent of the “Touka,” or Arabat Spit, are much exposed to these easterly winds, and there the short breaking sea, and dangerous surf and undertow, render boat’s work, whether for military or commercial operations, extremely hazardous.

After the end of August, these easterly winds, which have blown without intermission for a fortnight at a time, commence to abate, and are succeeded by short fierce squalls from the northward, varied with s.e. winds, which are preceded by dense fogs.

In the Gulf of Azov these true s.e. winds are, from the direction of the land, turned into easterly winds; but their character, and the fogs which accompany them, distinguish them clearly from the hot summer winds which blow from the vast sun-scorched steppes of Russia. Great and sudden variations of temperature are now experienced; 16° or 20° was not an unusual occurrence, and within twenty-four hours the temperature has fluctuated twice from 65° to 45° of Fahr., accounting fully for the squalls from the northward, and dense and sudden fogs from the s. These squalls give plenty of indication by a dense body of black clouds in the quarter from whence they may be expected.

In the neighbourhood of the “Sivash,” that is, from the head of “Oukliouk Liman” to Arabat Fort, these tornadoes blow with great violence, and generally from the n.; sometimes they are attended with much heavy thunder and lightning and hail of a formidable character.

Along the northern coast of the Sea of Azov, from Ghenitchi to Berdiansk, these squalls are usually from the n.w. or w.n.w., and from Berdiansk to Taganrog from n.e. to e.n.e. From the early part of October to the close of the navigable season heavy gales from the s.w. are frequent, varied with a blow from the eastward.

Completely landlocked as this sea is, and having no high lands bordering its shores, the seaman would naturally suppose that it could not be a very windy one; we, however, found it far otherwise; and the sudden manner in which the short and breaking sea got up called for good anchoring-tackle, especially if caught in an autumnal gale to leeward of all shelter, and obliged to anchor in the open sea. The Vesuvius and Grinder gun-boat were so

situated in a heavy easterly gale in November, 1855, and, although anchored in 40 feet water, and riding with 100 fathoms of chain a-head, they drove some distance, and the sea broke so much as to endanger the gun-boat considerably.

With westerly winds there is a total want of harbours in the Sea of Azov, especially at the trading ports of Berdiansk and Mariupol, and even off Taganrog, in what is called the "18-foot hole," a heavy sea rolls in. The holding ground is, however, good.

With easterly winds a seaman will generally find shelter by running under the lee of the various spits which project from the northern coast, avoiding, if possible, the Obitotchna, both on account of the shoal ground about it, as well as the difficulty of sighting a sand-bank, on which there is neither beacon nor light-house. Vessels caught in an easterly gale when near to the Strait of Yenikale, but unwilling to proceed to Kertch for shelter, will find safe anchorages at the following places:—

(1.) Under the lee of Ziúk Point and shoal.

(2.) In Kazantip Bay, off the village of Chagani, taking care not to anchor in less than 20 feet water, as it shoals abruptly from that.

(3.) In Arabat Bay, either under Cape Kiten or abreast the sandy isthmus connecting Cape Kazantip with the main.

No. (1.) is however the best; for should the wind back to the N.E., and blow, as it sometimes does, with much violence, vessels at anchor in any of these places must weigh and either bear up again for Kertch or stand on the starboard tack for Ghenitchi, where an admirable and safe anchorage may always be found in 18 to 19 feet water.

The East extreme of the Town of Ghenitchi	True N. 22° W.
South extreme of Beriutch Spit	S. 45° E.

In N.W. gales, which are not unusual in the autumn, especially upon the coast of the peninsula of Kertch, there is only one good anchorage, except in the Strait of Yenikale, throughout the southern part of the Azov, and that is under Cape Kazantip, in Kazantip Bay; but care should be taken to give a berth to the Wrangler patch. That patch is a cone of hard sand, which has formed round a sunken rock; it is steep to, shoaling suddenly from 5 fathoms to 11 feet, with only 8 feet water on the apex.

A vessel caught in a N.W. gale, 40 or 50 miles N.N.E. of Fanar Light, and the weather, as it often is, thick about the entrance of the Strait, must be careful not to get to leeward and run into Temriúk Bay; she should either anchor and ride it out where she is, or go into Kazantip Bay. Many Greek vessels are, I was told, annually lost in Temriúk Bay, and there were no less than six wrecks seen there in 1855.

Currents.—The currents at the northern entrance of the Straits of Yenikale are occasionally strong and very uncertain in their direction during the early spring and late in the autumn; this is occasioned, no doubt, by the strong local breezes in the sea of Azov on the one side, and those of the Black Sea on the other, as well as by the variations in the volume of water discharged at those seasons by the rivers of the Caucasus, the Don, and other streams, into the basin of the Azov.

The Sea of Azov, apart from being shallow, is less salt, and consequently of less density, than seas usually are; the action therefore of the wind, in increasing its depth in one part or diminishing it in another, is as natural as it is undoubted. Currents are, therefore, common, and I may almost say constant, throughout its whole area, and the assertion by M. Taitbout de Marigny in his generally correct and valuable 'Black Sea Pilot,' that there is little current in the Sea of Azov, is a palpable error. For instance, all the Russians agree in stating that the fluctuations in the volume of water in the Gulf of Azov were very great, and entirely depended upon the direction and force of wind. These fluctuations, it need hardly be said, could not take place without proportionately strong currents.

With easterly breezes of a force of 4 or 5 (a double-reefed breeze) we found the water in the basin of the Sea of Azov diminish about 2 feet on the weather side, and rise as much upon the leeward or western coast, and *vice versâ* with westerly gales.

Captain Lambert, in the Curlew, experienced off Mariúpol in a N.E. gale a fall of 5 feet of water, whilst we at the same time off Temriúk had (as far as could be observed in a cross-sea) an increased depth.

Such a banking up of the water appears nothing but natural in a wide-spread shallow basin, having but a narrow outlet at Yenikale, with another sea on the opposite side, in which strong gales from a contrary direction are often at the same moment blowing. Apart from these irregular currents, the rates of which are dependent upon the force of the wind, and which require the navigator to allow for their drift in shaping his course, there is a constant flow of water from the Sea of Azov into the Straits of Kertch, and thence into the Black Sea.

This discharge of the superabundant water of the Sea of Azov is sometimes checked by the action of a strong southerly gale in the Black Sea; but it never is for long: and occasionally, after the water being so pent-up, the current will run out of the Strait of Yenikale at the rate of 3 knots per hour. This natural current of the Sea of Azov is fed from three quarters:—

1st. From the Don, Donetz, and other streams, which discharge

themselves by a delta 15 miles in width, containing 14 or 15 mouths.

2nd. From the Sivash, or Putrid Sea, which drains all the eastern and northern shores of the Crimea, and receives the flow of the Salgir and Kara-su.

3rd. From the drainings of that extensive series of Limans comprised between Taman and Kamisheva on the east.

The current from the Don, first mentioned, may be said to be the main one flowing down the gulf. We see its action and direction in strong and unmistakable characters in the remarkable spits which extend from either shore. At the entrance of the Gulf of Azov, or, as the French have better named it, "Gulf of the Don," this current forks in three directions: the centre flows on in a s.s.w. course about 1 knot per hour, and impinges with considerable strength upon the coast of the Kertch peninsula from Cape Kazantip to Cape Kamenoi.

The northern branch of the Don current flows from Bielosarai spit in a w. by s. direction; we have found it varying from 1 knot to a knot and a half per hour. This current it is that has, in the lapse of ages, formed the extensive spits of Berdiansk and Obitotchna, and, met by the counter currents of the Sivash and westerly winds, created the broad extent of alluvial deposit known as the Beriutch spit.

The strength of this current is very perceptible to an observer standing on the south extreme of Beriutch spit, which is almost steep, with 18 feet water 100 yards off it. The stream flows direct towards Arabat Spit, inclining southward, although at times in the autumn, when the Sivash is low and an easterly wind causes the water to flow into it by the Strait of Ghenitchi, the current I have alluded to evidently curves up Oukliouk Liman, and supplies the drain caused upon it.

However the main tendency of the current before alluded to is southward, pressing strongly the while upon the beaches of the "Touka," or Arabat Spit, and depositing upon it all wreck, drift-wood, and other foreign substances brought out of the Gulf of Azov. Curving round Arabat Bay, and no doubt occasioning the very disagreeable sea peculiar to that locality with the least easterly wind, this northern branch of the Don current re-unites itself to the main stream about Cape Kazantip, and flows thence for the Straits of Yenikale. One of the strongest proofs that can be adduced of the existence of this northern branch of the Don current, apart from the information of the Greek pilots and our own observation, was the fact that within six weeks of the destruction of the Russian mercantile marine in the Sea of Azov by our squadron, the whole extent of Arabat Spit was strewn with wreck, although they had been mostly set on fire at distances varying

from 60 to 90 miles to the E., or on the track between Berdiansk and Kertch.

The southern branch of the Don current is, perhaps, the most questionable, though my authority for it was a very intelligent Ragusan seaman who had sailed in the Sea of Azov for many years. He asserted that this branch flowed nearly due s. as far as Kamisheva Point, and had formed the shoals and spit of the same name—an opinion which I fully agree in, and am of opinion that curving thence towards the Zelczin bank, in consequence of the outflow from the great water-intersected deltas of the Kuban, Protok, Beysough, and Chelbassy, it becomes identified with them, and may no longer be called the current of the Don.

The second important feeder of the Sea of Azov is from the Sivash or Putrid Sea; that current is occasionally interrupted, but yet that interruption is always followed by an accelerated discharge of water. The direction of this current is E. and W. in Ghenitchi Strait, but from the Oukliouk Liman it joins the northern branch of Gulf of Azov current, and sweeps southward with it along the Spit of Arabat. For further information as to the current of the Sivash, see the article under the head Sivash.

With respect to the third and last of the currents which keep up the healthful activity (if the term may be applied) of the basin of the Sea of Azov, it is simply derived from that series of deltas of rivers which lie E. of the peninsula of Taman, and, with the Kuban, drain the Ciscaucasian territory. These deltas comprise about 95 miles of low marshy country, and during the thaws of early spring and rains of the autumn a vast body of water is discharged by innumerable channels into extensive lagoons or "limans," as they are called, and thence into the Sea of Azov. This body of water naturally seeks an outlet by the Strait of Yenikale, and, owing to its freshness, the surface of the sea at Yenikale and Kertch are often fresh and potable when that of Arabat or Berdiansk is undrinkable; but the source of this current is liable to sudden changes, and, discharging over extensive and shallow "limans," an adverse wind easily checks the flow of water, apart from the droughts and other causes common to streams flowing from a steppe country.
